A KEY TO PLANT FAMILIES USING LEAVES, STEMS AND ROOTS

MARCH 1970 - NUMBER 5

BY

D. J. MORRÉ

JHRP

JOINT HIGHWAY RESEARCH PROJECT
PURDUE UNIVERSITY AND
INDIANA STATE HIGHWAY COMMISSION

Digitized by the Internet Archive
in 2011 with funding from
LYRASIS members and Sloan Foundation; Indiana Department of Transportation

http://www.archive.org/details/keytoplantfamili00morr

Progress Report

A KEY TO PLANT FAMILIES USING LEAVES, STEMS AND ROOTS

TO: J. F. McLaughlin, Director
Joint Highway Research Project

FROM: H. L. Michael, Associate Director
Joint Highway Research Project

March 15, 1970

File: 9-5-3

Project: C-36-48C

Attached is a Progress Report on the HPR Research Project "Research in Roadside Development and Maintenance." The title of the report is "A Key to Plant Families Using Leaves, Stems and Roots." It has been authored by Dr. D. James Morré, principal investigator on Part III of this project "Chemical Weed Control."

The key permits identification of most plants within the central United States at any stage of growth and is especially useful in the spring before the plants have flowered or set seed. Such identification is necessary for many purposes including determination of best means of weed control by chemicals. It is especially designed for use by personnel who are not professionally trained for plant identification.

The report is presented for information and acceptance. It will also be forwarded to the ISHC and BPR for review, comment and acceptance. Publication of this report is planned after favorable review and acceptance by all sponsoring groups.

Respectfully submitted,

Harold L Michael

Harold L. Michael
Associate Director

HLM:ms

cc: F. L. Ashbaucher
W. L. Dolch
W. H. Goetz
W. L. Grecco
M. J. Gutzwiller
G. K. Hallock
M. E. Harr
R. H. Harrell
J. A. Havers
V. E. Harvey
F. B. Mendenhall
R. D. Miles
C. F. Scholer
M. B. Scott
W. T. Spencer
H. R. J. Walsh
K. B. Woods
E. J. Yoder

Progress Report

A KEY TO PLANT FAMILIES USING LEAVES, STEMS AND ROOTS

BY

D. James Morre'
Associate Professor of Plant Physiology

Joint Highway Research Project

Project: C-36-48C

File: 9-5-3

Prepared as Part of an Investigation

Conducted by

Joint Highway Research Project
Engineering Experiment Station
Purdue University

in cooperation with the

Indiana State Highway Commission

and the

U. S. Department of Transportation
Federal Highway Administration
Bureau of Public Roads

The opinions, findings and conclusions expressed in this publication are those of the authors and not necessarily those of the Bureau of Public Roads.

Not Released for Publication

Subject to Change

Not Reviewed By
Indiana State Highway Commission
or the
Bureau of Public Roads

Purdue University

Lafayette, Indiana

March 15, 1970

TABLE OF CONTENTS

Page

PE AND OBJECTIVES. ii

MARY OF PLANT CLASSIFICATION 1

IEW OF TERMS USED IN DESCRIBING PLANTS.

Habitat and habit of growth 3
Vegetative parts. 4

ETATIVE KEY TO PLANT FAMILIES USING LEAVES, STEMS AND ROOTS 6

IONAL FLORAS AND PLANT IDENTIFICATION MANUALS 20

SSARY 22

I. SCOPE AND OBJECTIVES

Any individual working in the area of roadside development has on occasion the need to identify plants. This is particularly important in the specific areas of weed control and management of natural vegetation. It is essential that the identity of the plants involved be established before intelligent recommendations can be made.

There are various ways to identify plants but one method has proven singularly successful with maximum efficiency and minimum chance for error. This system involves classification on the basis of family characteristics. The plant families are aggregations of related plants and are sufficiently few in number that with a minimum amount of effort it is possible to categorize plants into their correct family. Once a plant has been identified to family, it is a relatively simple matter to establish the genus and species using an illustrated manual to the flora of the specific region.

For the agriculturalist, engineer or conservationist working in roadside development, it is most unfortunate that professional botanists use family designations based on flower or fruit characteristics. Botanists consider these characteristics to be the most stable feature within a plant group and use them for this reason and not because they are necessarily easy to use. Flower parts are small and complicated and descriptions are couched in technical jargon. For example, the statement "stamens mostly perigynous (adnate to perianth), epigynous or inserted on or at the base of a hyphgynous disk" has no meaning except to the specialist. Additionally, grouping plants according to flower structure makes the presence of flowers necessary for positive identification.

Beginning in 1966, research was initiated to develop a classification system which relied less on flower structure and more on vegetative parts

(leaves, stems and roots). Leaves, stems and roots are external plant characteristics which are easy to recognize. They can be described simply and are present on the plant throughout the entire life cycle. In the beginning, we recognized only a few families which could be identified solely on the basis of vegetative characteristics. However, as research progressed, it became apparent that within a comparatively restricted area such as the Central United States, most plants could be identified to family solely on the basis of vegetative characteristics.

This report presents the results of a study to develop a practical Key to Plant Families Based on Vegetative Characteristics. The present key is restricted to herbaceous terrestrial plants (land plants excluding trees). Trees are excluded because of the number of excellent guides to identification of the trees which already exist based on leaves, twigs and buds. Aquatic plants (plants growing in water) are most easily handled as a group and a separate key to the aquatic plants is in the early stages of preparation. Technical terms are avoided and a glossary is provided. In addition to being easily mastered, the vegetative key permits plant identification in early spring when flowering or fruiting specimens are not available for most plants.

II SUMMARY OF PLANT CLASIFICATION

Some of the categories into which plants are classified are given below. The categories are shown in captial letters and examples given (in parenthesis) for oft-hairy form of Prairie Rose (*Rosa arkansana* Porter, var. suffulta)*

OM (Plant)

VISION (Spermatophyta)

SUBDIVISION (Angiospermae)

CLASS (Dicotyledoneae)

SUBCLASS (Archichlamydeae or Polypetalae)

ORDER (Rosales)

FAMILY (Rosaceae)

Subfamily (Rosoideae)

Tribe (Roseae)

GENUS (Rosa)

SPECIES (*Rosa arkansana*)

Variety or Form (suffulta)

The family is the smallest of the major categories. It is the most frequently untered unit in the taxonomic studies and one of the most natural and useful. The of the family varies from a single genus, e. g. Horsetail Family (Equisetaceae) everal genera, e. g., Sunflower Family (Compositae). A few unnatural or artificial pings of plants into families are recognized by botanists such as the Saxifrage ly (Saxifragaceae).

The names applied to all categories or classifications are Latin names. With ain exceptions, the Latin names of the major categories of plants have uniform ngs such as *-ales* for order and *-aceae* for family. With large families, it is rable to divide them into subfamilies as is done for the Sunflower Family (Compositae) e bear Latin names usually ending in *-oideae*. Subfamilies are further divided into rdinate groups called tribes ending in *-eae*. This is done for the Grases

---

e Name (often abbreviated, but not underlined) following botanical binomials refers the botanist first accurately and validly describing the plant and giving it its sent name. As indicated by the above citation, the binomial was published by mas Conrad Porter, 1822-1901, a student of the Colorado flora.

ineae) and the Composites (Compositae) in this course. Occasionally, it is nient to further subdivide tribes into subtribes.

Minor categories of classification are those where the name becomes part of the of the plant. These include genus, species, varieties, forms, clones and taxa. and species may be further subdivided for convenience into subgenera and ecies. The genus is subordinate to the family with each family having one or more included in it. Neither generic nor specific names have uniform endings. In al, a genus is comprised of species with more characteristics in common than with rs of other genera in the same family. The members of a genus are the species. plant, then, has a generic and a specific name which is always capitalized. The d word or specific name is not capitalized. Both words are written in italics, underscored in ordinary writing, e.g., Poa annua is Annual Bluegrass.

The rules of nomenclature dealing with variations within a species are least exact. ty has been used indiscriminately by horticulturalists to describe any variant n a species. Clone is applied universally to individual plants propagated atively. Form or the Latin forma is the smallest category of ordinary taxonomic It is usually applied to trivial variations such as flower color.

Thus the scientific names of plants are based on the Latin language which is fic and exact in meaning and which employs the Roman alphabet. The latter tage eliminates confusion resulting from use of other alphabets such as Greek or rit. Difficulties with common names are the multitude in existence for a single es, the absence of common names for other species and the restriction of their use people of one language. For example, just in the United States, Abutilon theophrasti own as Velvet Leaf, Indian Mallow, Butter Print, Butter Printer, Pie Print, Pie er, Pie Marker, Cooton Weed or Corn Weed. Doubtless, other common names for this exist. Also, plants with similar common names may be taxonomically unrelated. d Dock (Rumex crispus) is in the Smartweed Family (Polygonaceae). Prairie Dock phium terebinthinaceum) is in the Sunflower Family (Compositae). Adder's Tongue

e either the genus Ophoglossum (not a flowering plant) or the genus Erythronium e Lily Family (Liliaceae). In French Quebec, Knotweed becomes Renouee and so . Unfortunately, even though the confusion is lessened by standardization of sh names, a complete change to the vernacular would simply create new problems. xample, even though the standardized common names are used throughout this manual, not possible to identify plants if only their common names are known. All ical works by which plants are classified use Latin names.

However, since both common and Latin names are included with each family, the ning student of plant identification may wish to start by associating plants with common names. Latin names are polysyllabic, difficult to pronounce and remember, ften may be completely without meaning to those who have never studied Latin. er, the serious student should become sufficiently familiar with their use to t him to consult intelligently the standard taxonomic works dealing with plant ification.

III REVIEW OF TERMS USED IN DESCRIBING PLANTS

Plant identification consists of knowing what similarities and differences among s are diagnostic and what combinations of characteristics are sufficient to assign ecimen to a particular family to the exclusion of all other families. Good specimens ssential for the beginner. Choose plants of representative size having flower or e fruits (preferably both). Many characteristics of plants useful in identification luscussed in the following section.

A. HABITAT AND HABIT OF GROWTH

Many families are composed exclusively of woody plants. Other families may contain r more woody members. Since woody species are fewer in number than herbaceous es, with a variety of vegetative characters (including buds, inner bark, outer , etc.), these plants usually can be identified (to family and genus and sometimes ecies) using a good vegetative key.

Aquatic plants are a group that can be separated on the basis of habitat. For

consult the Key to Families of Aquatic Plants which will be provided later.

Plants may be twining (with or without tendrils) and either herbaceous and ng or woody twining.

Parasitic plants are restricted to the habitat of their hosts. Beech-drops omrape Family) which parasitize the roots of Beech trees are found only in beech ining forests. Dwarf Mistletoe (Arceuthobium pusillum) is restricted largely to e, growing in moist areas in the northern part of the region.

B. VEGETATIVE PARTS

Vegetative plant parts used in identification include the following :

LEAVES:

Parts: blade, petiole, stipules (collar and sheath in grasses)

Arrangement: alternate, opposite, whorled

Kind: simple, pinnately compound, palmately compound

Venation: parallel, pinnately netted, palmately netted

STEMS

Parts: node, internode, axil, bud

Kind: aerial (herb, vine, shrub, tree), aquatic, subterranean or underground (rhizome, bulb)

ROOTS

Kind: fibrous, tap, fleshy

Duration: annual, biennial, perennial

Vegetative plant parts (leaves, stems and roots) are usually most conspicuous and al to the beginner because of their simplicity and ease of observation (seldom iring magnification or dissection). However, the use of vegetative characteristics dentification is limited and imprecise since since they are few in number and what variable.

Vegetative characteristics important in family determinations are summarized below:

Leaves present vs. leaves absent

Basal rosette present or absent

Plant erect vs. twining (tendrils present or absent)

Stem round vs. stems square or triangular

Stems angular and straited vs. angular and uniformly green

Milky sap vs. watery sap (Break off a leaf near the apex to determine)

Spines or prickles present or absent

Stipules present vs. stipules absent

Leaves opposite or whorled vs. leaves alternate

Leaves simple vs. leaves compound

Leaves entire vs. leaves lobed or divided

Leaf margins entire vs. leaf margins toothed

Leaf base tapering vs. leaf base broad

Venation parallel vs. venation net (pinnate vs. palmate)

Leaf organization palmate vs. other than palmate

Stems or leaves pubescent (hairy) vs. smooth (without hairs)

Leaves punctate vs. not punctate (dotted with small holes)

Some plants have distinctive odors when crushed, e.g. minty odor for the mint ly (Labiateae) and a rank odor for the Potato Family (Solanaceae).. With other lies, the foliage may have a distinctive taste, e.g. bitter for the Figwort ly (Scrophulariaceae) and peppery for many members of the Mustard Family uciferae).

Other characteristics of leaf form, leaves petioled vs. sessile, hairiness, face characters, coloration and size are useful in species identification.

IV. VEGETATIVE KEY TO PLANT FAMILIES

USING LEAVES, STEMS AND ROOTS

NOTE: Members of certain plant families marked by an asterisk* are often confused with members of the Sunflower (Composite) Family when identification is based solely on vegetative characteristics. A simple test given at the end of the key will often permit one to distinguish Composites from plants of other families.

1a. Leaves absent or much reduced - 2.

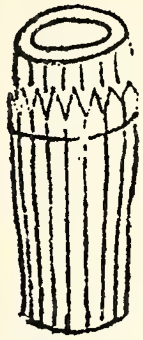


Fig. 1

2a. Plants without chlorophyll (not green) - 3.

3a. Plants a yellow twining mass of thread-like stems attached to a host plant by means of haustoria or suckers - . . . . Dodder; Morning Glory Family (Cuscuta; Convolvulaceae).

3b. Plants erect, not twining and thread-like - . . . . Orchid Family (Orchidaceae).

2b. Plants with chlorophyll (green) - 4.

4a. Plants fleshy and with spines - Catus Family (Cactaceae).

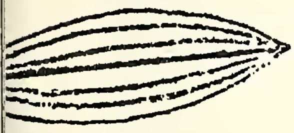


Fig. 2

4b. Plants not fleshy and without spines (jointed stem, branched or unbranched and bearing a whorl of scale-like leaves at each node, Fig. 1. . . . . Horsetail Family (Equisetaceae).

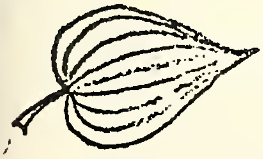


Fig. 3

1b. Leaves present - 5.

5A. LEAVES WITH BOTH PARALLEL VENATION (AT LEAST THE MAJOR VEINS) AND ENTIRE MARGINS (Fig. 2). Note: With leaves having only one vein evident or with very succulent leaves where venation is not readily determined, proceed to 5B, page - 8.

6a. Petioles distinct - 7.

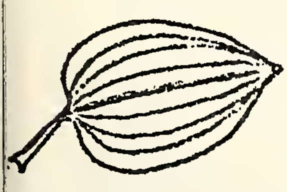


Fig. 4

7a. Plants twining; leaf veins converging at the tip of leaf (Figs. 3 and 4) - 8.

8a. Stems green; leaves usually ovate and long-pointed (Fig. 3) - Greenbrier; Lily Family (Smilax; Liliaceae

8b. Stems greenish-brown; leaves usually heart-shaped and short-pointed (Fig. 4) - . . . . Wild Yam; Yam Family (Dioscorea; Dioscroeaceae)

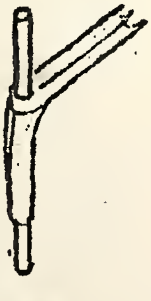


Fig. 5

7a. Plants erect - 9.

9a. Stems with milky juice (remove a leaf near the top of the plant - . . . . Lettuce Subfamily; Sunflower Family (Liguliflorae; Compositae).

9b. Stems without milky juice - . . . . Plantain Family (Plantaginaceae).

6b. Petioles absent or much reduced - 10.

10a. Plants grass-like; leaves with a distinct basal sheath surrounding the stem (Fig. 5); annuals or perennials from stolons or rhizomes; stems flattened, round or triangular - 11.

As seen from above.

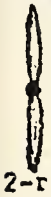


Fig. 6

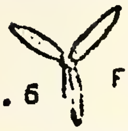


Fig. 7

11a. Stems triangular △ - Sedge Family (Cyperaceae).

11b. Stems round ○ or flattened ⬯ but never triangular - 12.

12a. Stems stiff and grass-like with conspicuous nodes - 13.

13a. Leaf arrangement 2-ranked (Fig. 6). - . . . . Grass Family (Gramineae).

13b. Leaf arrangement 3-ranked (Fig. 7) - . . . . Rush Family (Juncaceae).

12b. Stems soft and pithy - 14.

14a. Leaf arrangement 3-ranked (Fig. 7) - . . . . Rush Family (Juncaceae).

14b. Leaf arrangement 2-ranked (Fig. 6) - 15.

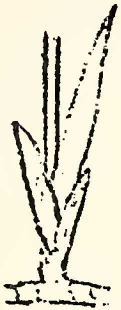


Fig. 8

10b. Plants lily-like, perennials from bulbs, corms or rhizomes; stems round or flattened but never triangular - 15.

15a. Slender, erect herbs; stems with a tough covering not easily penetrated with the fingernail - . . . . Gentian Family (Gentianaceae)*.

15b. Stems soft, easily penetrated by the fingernail - 16.

16a. Leaves distinctly keeled and flattened against the stem (Fig. 8) - . . . . Iris Family (Iridaceae).

16b. Leaves not both distinctly keeled and flattened against the stem - 17.

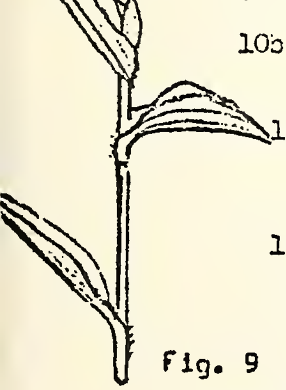


Fig. 9

17a. Leaves with long hairs on margins and/or dialated at base to form a tubular sheath (Fig. 9); stems soft, with conspicuous nodes and containing a watery mucilaginous (stringy) sap - . . . . Spiderwort Family (Commelinaceae).

17b. Leaves without long hairs on margins or not dialated at base; stem sap not noticibly stringy - 18.

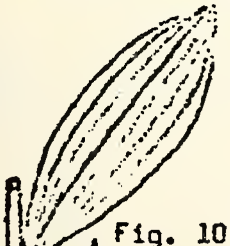


Fig. 10

18a. Basal leaves broadly egg-shaped with widely-spaced principal veins (Fig. 10) - Orchid Family (Orchidaceae); False Hellebore, Buchflower, Plantain Lily, Solomon's Seal (Genera: Veratrum, Melanthium, Hosta, Clintonia, Disporum, Smilacina, Polygonatum) of the Lily Family (Liliaceae).

18b. Basal leaves linear or if broadly egg-shaped, principle veins not widely spaced - 19.

19a. Linear leaves, all basal, with the lowest leaves differing from the rest and forming a basal sheath (Fig. 11) - Amaryllis Family (Amaryllidaceae)

19b. Linear or egg-shaped leaves on flowering stems as well as basal; lowest leaves not forming a distinct basal sheath - Lily Family (Liliaceae).

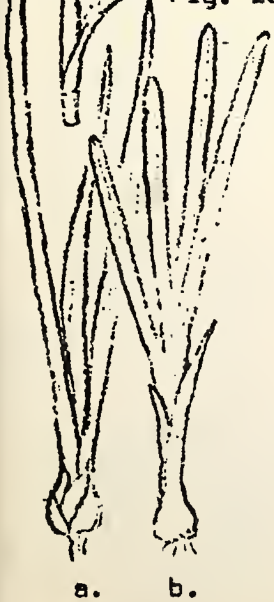


Fig. 11

5B. LEAVES WITH NET VENATION (PALMATE OR PINNATE) (Fig. 12) OR LEAVES HAVING BOTH PARALLEL VENATION AND SERRATED OR TOOTHED MARGINS - 20.

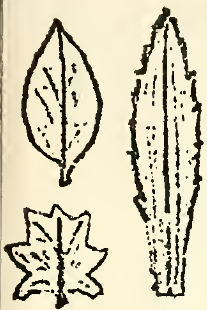


Fig. 12

20a. Leaves fern-like (fronds); young fronds coiled at the tips, arising from a rhizome - Fern Family (Polypodiaceae)

20b. Plants not fern-like and leaves not coiled at the tips when young - 21.

21a. Perennials from a corm or thick rhizome; leaves very large on long petioles (1-2ft), solitary or in groups of several; leaf sheaths with parallel veins; plants of bogs or moist woodlands (Fig. 13) - . . . . Arum Family (Araceae).

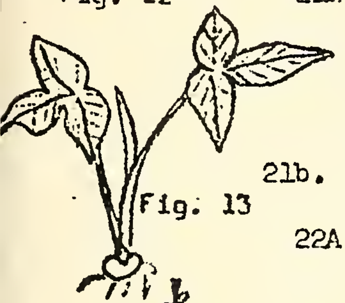


Fig. 13

21b. Without the above combination of characteristics - 22.

22A. LEAVES CLUSTERED BASALLY INTO A ROSETTE; STEM LEAVES. IF PRESENT, CONSIDERABLY SMALLER THAN ROSETTE LEAVES (Fig. 14) - 23.

22B. SEE PAGE 11 .

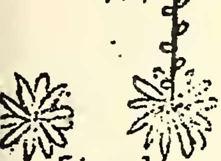


Fig. 14

23a. Rosette leaves simple (Fig. 15) - 24.

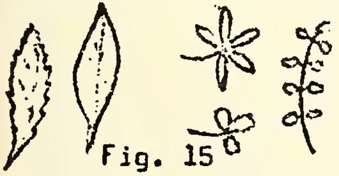


Fig. 15

simple vs. compound

24A. ROSETTE LEAVES PALMATELY VEINED, LOBED OR DISSECTED (Fig. 16) - 25.

25a. Upper and lower leaves different; rosette leaves on long petioles, upper stem leaves on very short petioles or sessile (without petioles) and divided into 3 to 5 or more leaflets with toothed or entire margins (Fig. 48, p. 13) . . . . Buttercup Family (Ranunculaceae).

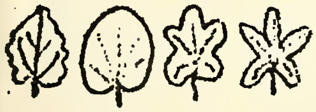
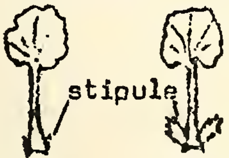


Fig. 16

25b. Upper and lower leaves not markedly different or, if different, upper leaves with petioles - 26.

26a. Stiples present at base of petiole (Fig. 17) - 27.



simple vs. elaborate

Fig. 17

27a. Rosette leaves smooth and heart-shaped (Fig. 18) - . . . . . . Violet Family (Violaceae).

27b. Rosette leaves never both smooth and heart-shaped usually circular in outline (Fig. 19) or if heart-shaped, with hairs or rough-surfaced - 28.

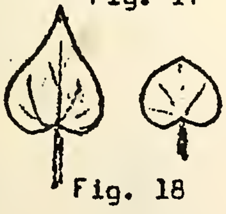


Fig. 18

28a. Nodes conspicuous; stiples simple (Fig. 17); stem leaves opposite - . . . . Geranium Family (Geraniaceae).

28b. Nodes inconspicuous; stipules elaborate (Fig. 17); stem leaves alternate - . . . . Rose Family (Rosaceae).

26b. Stipules absent at base of petiole - 29.

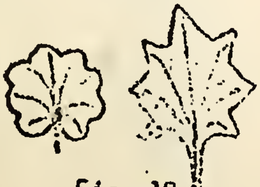


Fig. 19

29a. Stems with orange-colored, milky sap - . . . . Poppy Plant Group; Poppy Family (Papaveraceae).

29b. Stems without milky sap - 30.

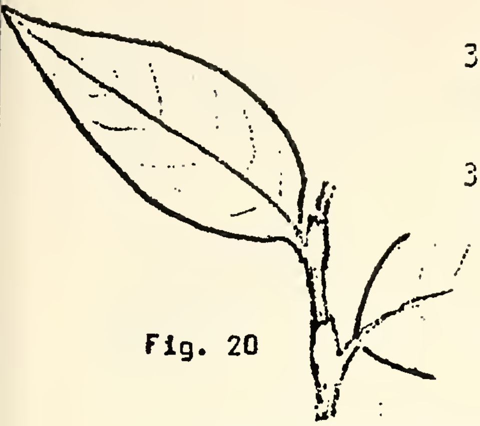


Fig. 20

30a. Stems fibrous (not easily broken), leaf petioles without long hairs . . . . Mallow Family (Malvaceae).

30b. Stems easily broken 31.

31a. Leaf petioles with long hairs - . . . . . Saxifrage Family (Saxifragaceae).

31b. Leaf petioles smooth or nearly so - . . . . . Waterleaf; Waterleaf Family (Hydrophyllum; Hydrophyllaceae).

24B. ROSETTE LEAVES NOT PALMATELY VEINED, LOBED OR DISSECTED - 32.

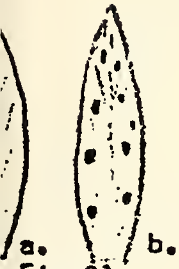


Fig 21

32a. Stems with milky juice (detach a young leaf near the top of the plant) - 33.

33a. Milky juice white in color - 34.

34a. Basal leaves long-petioled and heart-shaped or without petioles and completely surrounding the stem, never deeply lobed or with prickles on the lower surface of the midrib; stems often angular - . . . . Bell Flower Family (Campanulaceae).

34b. Basal leaves not long-petioled and heart-shaped, often deeply lobed or with prickles on the lower surface of the midrib; stems round - . . . . Lettuce Subfamily; Composite Family (Liguliflorae; Compositae).

33b. Milky juice orange in color - Poppy Family (Papaveraceae)

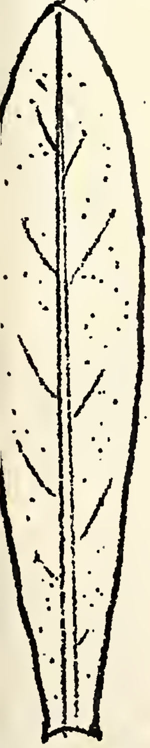


Fig. 22

32b. Stems without milky juice - 35.

35a. Membraneous stipules sheathing stem above each node . . . . (Fig. 20) - Smartweed Family (Polygonaceae).

35b. Membraneous stipules absent - 36.

36a. Rosette leaves entire (margins uncut, Fig. 21) - 37.

37a. Rosette leaves splotched with distinct purple spots (Fig. 21b) - . . . . Evening Primrose Family (Onagraceae).

37b. Rosette leaves without purple spots - 38.

38a. Rosette leaves hairy and without long petioles - 39.

39a. Rosette leaves broadly oblong (Fig. 22), smooth to the touch, grey-wooly - Common Mullein; Figwort Family (Verbascum thapsus; Scrophulariaceae)*

39b. Rosette leaves narrowly oblong (tongue-shaped (Fig. 23) and rough to the touch, grey-green - Borage Family (Boraginaceae)*. NOTE: In addition to Composites, some other plants, notably Mustards may fit this description. Mustards usually have a whitish tap root, whereas the taproot of the Borages tends to be covered with a dark, fibrous outer layer.

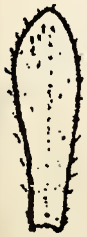


Fig. 23

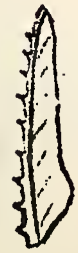


Fig. 24

38b. Rosette leaves not densely hairy OR if densely hairy with petioles greater than 1/4 inch long - 40.

40a. Leaves with prickles - 41.

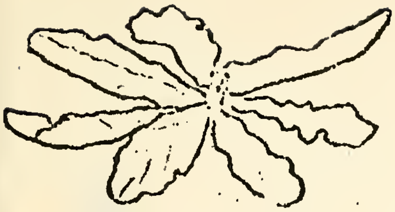


Fig. 25

41a. Prickles blunt, leaves otherwise smooth (Fig. 24) - Teasel; . . . . . . Teasel Family (Dipsacus sylvestris; Dipsacaceae).

41b. Prickles slender; leaves smooth to dense hairy - . . . . Thistle Tribe of the Sunflower Family (Cynareae; Compositae)*

40b. Leaves without prickles - likely a member of the Sunflower Family (Compositae)*.

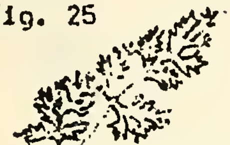


Fig. 25

36b. Rosette leaves with toothed, cut, notched or lobed margins - 42.

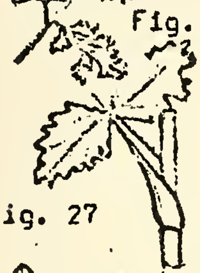


Fig. 27

42a. Rosette leaves dark green in circles of 6-8, overlapping little if at all and lying flat on the ground (Fig. 25) - Moth Mullein; Figwort Family (Verbascum blattaria; Scrophulariaceae). If the species description does not fit Moth Mullein, check 40ab, make the Composite test* page and if neither Teasel nor a Composite, proceed to 42b.

42b. Rosette leaves not as above - 43.

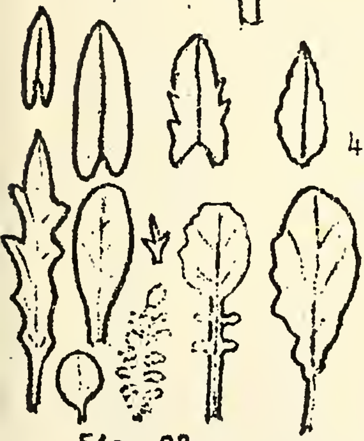


Fig. 28

43a. Rosette leaves finely divided (Fig. 26) - 44.

44a. Inflated petiole surrounding the stem (Fig. 27); tap root - Carrot Family (Umbelliferae).

44b. Petiole not inflated, perennials from rhizomes or a cluster of small tubers - Fumitory Plant Group; Poppy Family (Papaveraceae).

43b. Rosette leaves not finely divided - 45.

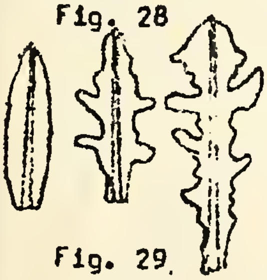
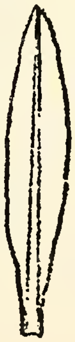


Fig. 29



45a. Rosette and stem leaves different (Fig. 28); leaves occasionally with a peppery taste - . . . . Mustard Family (Cruciferae)*.

45b. Rosette and stem leaves similar - 46.

46a. Leaves smooth or finely hairy; more than twice as long as broad, major leaf veins wide and conspicuous (Fig. 29), often pink to red - . . . . Evening Primrose Family (Onagraceae).

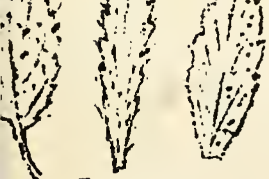


Fig. 30

46b. Leaves with long hairs nearly spherical to about twice as long as broad; major leaf veins not noticably conspicuous (Fig. 30) - 47.

47a. Rosette leaves with toothed margins but not deeply lobed . . . . Saxifrage Family (Saxifragaceae).

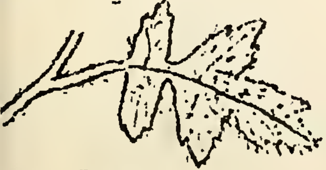


Fig. 31

47b. Rosette leaves deeply lobed, each lobe with toothed margins (Fig. 31) - . . . . . . Waterleaf Family (Hydrophyllaceae).

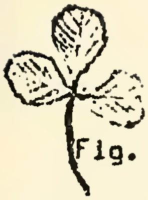


Fig. 32

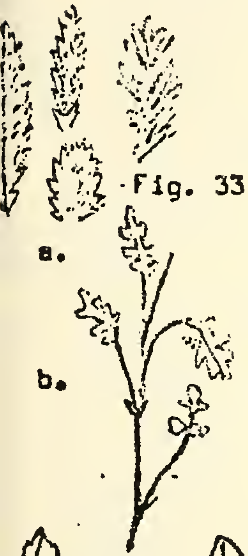


Fig. 33

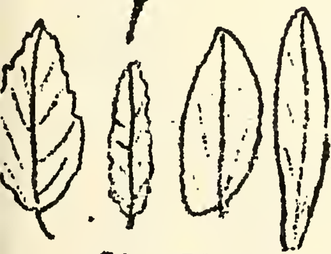


Fig. 35

23b. Leaves compound - 48.

48a. Inflated petiole sheathing the stem (Fig. 27) - . . . . Carrot Family (Umbelliferae).

48b. Petiole not inflated - 49.

49a. Leaflets finely toothed, smooth or with short hairs (Fig. 32) - . . . . . . Legume Family (Leguminosae).

49b. Leaflets coarsely toothed with long hairs (Fig. 33a) - 50

50a. Leaf petioles straight - Rose Family (Rosaceae).

50b. Leaf petioles gently curving (Fig. 33b) - Phacelia; Waterleaf Family (Phacelia; Hydrophyllaceae).

22B. LEAVES NOT CLUSTERED INTO A BASAL ROSETTE BUT ARRANGED VARIOUSLY ALONG THE STEM - 51.

51a. Stems with milky juice (detach a young upper leaf) but never twining - 52.

52a. Leaves with prickles - 53.

53a. Stem sap orange in color - Poppy Family (Papaveraceae).

53b. Stem sap white to pale yellow - Lettuce Subfamily; Sunflower Family (Ligulifloracea; Compositae).

52b. Leaves without prickles - 54.

54a. Stems ridged or angular, leaves never entire (Fig. 34)- . . . . . Bell Flower Family (Campanulaceae).

54b. Stems round, or if ridged or angular, leaves entire - 55.

55a. Stipules present; leaves entire or with toothed edges (Fig. 35), sometimes asymetrical at the base and with a reddish splotch; if entire leaves alternate below and whorled near the top - . . . . Spurge Family (Euphorbiaceae).

55b. Stipules absent or minute; leaves opposite, alternate or whorled - 56.

56a. Leaves opposite and smooth; stems often branched (Fig. 36), smooth and fibrous; perennials from creeping rootstocks - Dogbane Family (Apocynaceae).

56b. Leaves oposite, alternate or whorled; if whorled, leaves arranged uniformly in groups of 3 to 7; stems often slightly hairy - . . . . Milkweed Family (Asclepiadaceae).

51b. Stems without milky juice, OR, if with milky juice, then stems twining - 57.

34

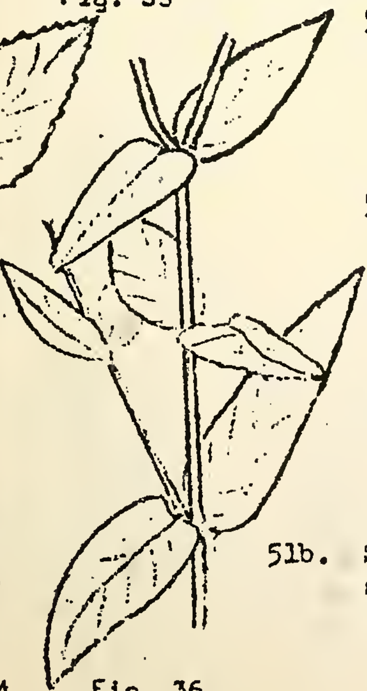


Fig. 36

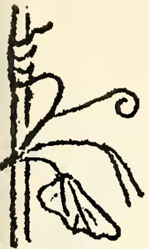


Fig. 37

57A. STEMS TWINING - 58. (57B, p. 13)

58a. Stems woody at base - 59.

59a. Climbing by tendrils (Fig. 37) - 60.

60a. Leaves entire (Fig. 4) - . . . . Greenbrier; Lily Family; (Smilax; Liliaceae).

60b. Leaves simple or compound but with lobed or toothed edges - 61.

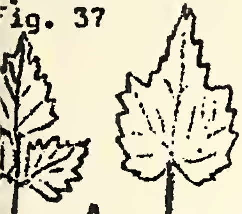


Fig. 38

61a. Leaves compound, or if simple, with deeply toothed margins (Fig. 38) - . . . . . Grape Family (Vitaceae).

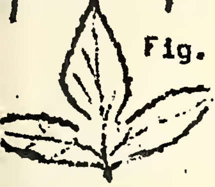


Fig. 39

61b. Leaves simple, entire or with shallowly toothed margins (Fig. 39) - . . . . Passion Flower Family (Passifloraceae).

59b. Not climbing by tendrils - 62.

62a. Leaf organization palmate or 3-lobed (Fig. 16) - 63.

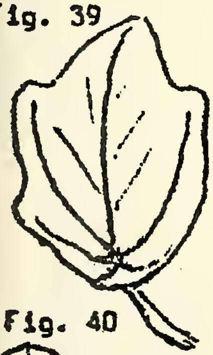


Fig. 40

63a. Leaves simple, peltate near margins (petioles attached to the underside of the leaf near the bottom edge (Fig. 40) - . . . . . Moonseed Family (Menispermaceae).

63b. Leaves compound, petiole attachment not as above - . . . . Buttercup Family (Ranunculaceae).

62b. Leaf organization other than palmate - 64.

64a. Leaves simple (Fig. 15) - 65.

65a. Stems bright green (Fig. 4) - . . . . Greenbrier, Lily Family (Smilax; Liliaceae).

65b. Stems greenish-brown - 66.

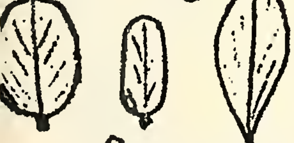


Fig. 41

66a. Leaves heart-shaped (Fig. 3) - . . . . Wild Yam, Yam Family (Dioscorea; Dioscoreaceae).

66b. Leaves egg-shaped (Fig. 41) - . . . . Honeysuckle Family (Caprifoliaceae).

64b. Leaves compound - 67.

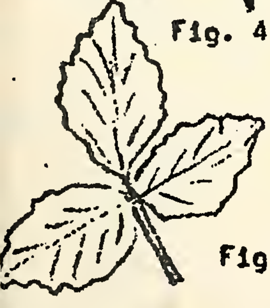


Fig. 42

67a. Leaves trifoliate (Fig. 42) - . . . . Sumac Family (Anacardiaceae).

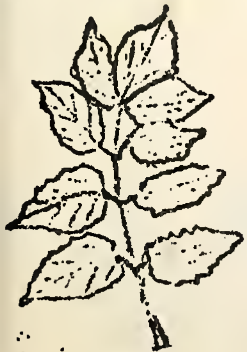


Fig. 43

67b. Leaves with 7-9 leaflets (Fig. 43) - Trumpet Creeper, Bignonia Family (Campsis radicans; Bignoniaceae).

58b. Stems herbaceous - 68.

68a. Climbing by tendrils (Fig. 37) - 69.

69a. Leaves compound - . . . . Legume Family (Leguminoseae).

69b. Leaves simple - . . . . . Gourd Family (Cucurbitaceae).

68b. Not climbing by tendrils - 70.

70a. Leaves simple - 71.

71a. Membraneous stipules sheathing stem above each node (Fig. 20) - . . . . . Wild Buckwheat; Smartweed Family (Polygonum convolvulus; Polygonaceae).

71b. Sheathing stipules absent - 72.

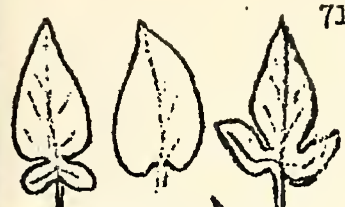


Fig. 44

72a. Leaves opposite - . . . . . Climbing Milkweed; Milkweed Family (Ampelamus albidus; Asclepiadaceae).

72b. Leaves alternae - 73.

73a. Leaf veins converging at tip of leaf (Figs. 3,4) - 74.

74a. Stems green and leaves usually egg-shaped (Fig. 4) - . . . . Greenbriar; Lily Family (Smilax; Liliaceae).

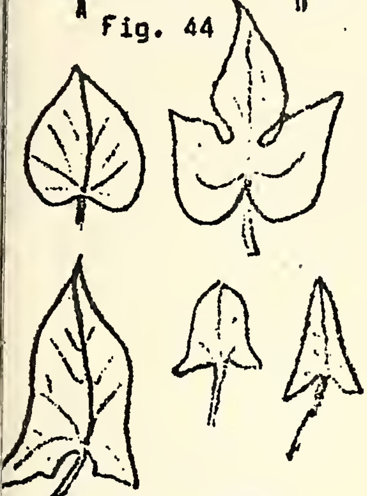


Fig. 45

74b. Stems greenish-brown; leaves usually heart-shaped and short pointed (Fig. 3) - Wild Yam; Yam Family (Dioscorea; Dioscoreaceae).

73b. Leaf veins not converging at tip of leaf - 75.

75a. Leaves variously lobed at base (Fig. 44), Not all heart-shaped; disagreeable odor when crushed - Bitter Nightshade; Potato Family (Solanum dulcamara; Solanaceae).

75b. Leaves entire or variously lobed, often heart-shaped (Fig. 45), no disagreeable order when crushed - . . . . Morning Glory Family (Convolvulaceae).

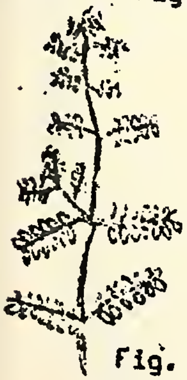


Fig. 46

70b. Leaves pinnately compound (Fig. 46) - 76.

76a. Leaves without stipules - Puncture Vine; Caltrop Family . . . . . . (Tribulus terrestris; Zygophyllaceae)

76b. Leaves with stipules - 77.

77a. Leaflets entire - . . . . Legume Family (Leguminosae).

77b. Leaflets serrate or toothed - . . Rose Family (Rosaceae).

57B. STEMS NOT TWINING - 78.

78A. LEAVES SIMPLE - 79.

79A. LEAVES PALMATELY LOBED, DISSECTED OR VEINED (Fig. 16) - 80.

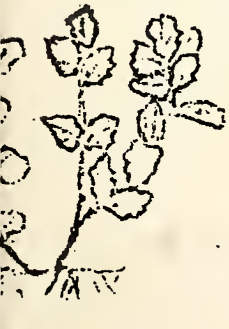


Fig. 47

80a. Stems square ☐ - . . . . Mint Family (Labiateae).

80b. Stems round ○ or angular ⬠ but not square - 81.

81a. Leaves ovate to oblong with toothed margins (Fig. 47); small plants, much branched at creeping bases - Thyme-leaved Speedwell; Figwort Family (Veronica serphyllifolia; Scrophulariaceae).

81b. Without the above combination of characters - 82.

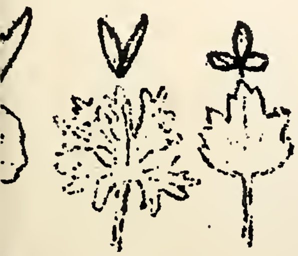


Fig. 48

82a. Upper and lower leaves different; lower leaves on long petioles, upper stem leaves on very short petioles or sessile (without petioles) and divided into 3 to 5 or more leaflets with toothed or entire margins (Fig. 48) - . . . . Buttercup Family (Ranunculaceae).

82b. Upper and lower leaves not markedly different, OR, if different, upper leaves with distinct petioles - 83.

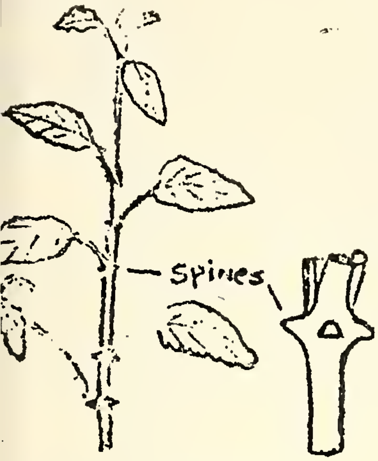


Fig. 49a

83a. Stipules present at base of petiole (Fig. 17) - 84.

84a. Leaves smooth and heart-shaped (Fig. 18) - . . . . Violet Family (Violaceae).

84b. Leaves not both smooth and heart-shaped, usually circular in outline (Fig. 19) or if heart-shaped, with hairs or rough-surfaced - 85.

85a. Nodes conspicuous; stipules simple (Fig. 17); stem leaves opposite - Geranium Family (Geraniaceae).

85b. Nodes inconspicuous; stipules elaborate (Fig. 17); stem leaves alternate - . . . . Rose Family (Rosaceae).

83b. Stipules absent at base of petiole - 86.

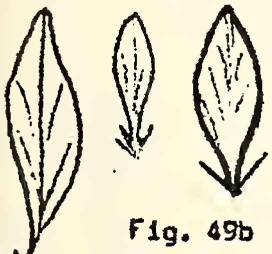


Fig. 49b

86a. Stems with orange-colored, milky sap - Poppy Plant Group; Poppy Family (Papveraceae).

86b. Stems without milky sap - 87.

87a. Stems fibrous (not easily broken), leaf petioles without lone hairs - . . . . Mallow Family (Malvaceae).

87b. Stems easily broken - 88.

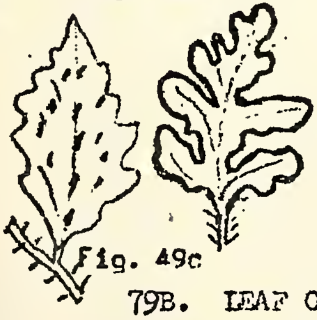


Fig. 49c

88a. Leaf petioles with long hairs - . . . . . Saxifrage Family (Saxifragaceae).

88b. Leaf petioles smooth or nearly so - Waterleaf; Waterleaf Family (Hydrophyllum; Hydrophyllaceae)

79B. LEAF ORGANIZATION OTHER THAN PALMATE - 89.

89a. Stems spiny or with short, blunt projections restricted to 2 or 3 below each node - 90.

90a. Spiny projections short and blunt, restricted to 2 or 3 below each node (Fig. 49a) - . . . . Prickly Sida; Mallow Family (Sida Spinosa; Malvaceae).

90b. Spines sharp, not restricted to nodes - 91.

91a. Leaves with entire margins (Fig. 49b) - Pigweed Family (Amaranthaceae).

91b. Leaves with lobed or toothed margins (Fig. 49c) - . . . . . Potato Family (Solanaceae).

89b. Stems without spines - 92.

92a. Stems square - 93.

93a. Leaves and stems strongly aromatic with a minty odor - . . . . Mint Family (Labiatae).

93b. Leaves and stems without a minty odor - 94.

94a. Leaves with toothed margins - 95.

95a. Leaf teeth rounded (Fig. 50a) - . . . . Mint Family (Labiatae).

95b. Leaf teeth pointed (Fig. 50b) - Vervain Family (Verbenaceae).

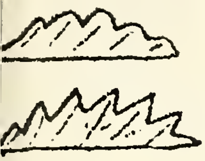


Fig. 50

94b. Leaves entire - 96.

96a. Leaves heart-shaped (Fig. 51) - . . . . . . Wild Four O'Clock Family (Nyctaginaceae).

96b. Leaves linear or egg-shaped (Fig. 52) - 97.

97a. Leaves whorled at each node; plants clinging to clothing by means of hooked hairs on the stem (Fig. 53) - . . . . Bedstraw; Madder Family (Galium; Rubiaceae).

97b. Leaves opposite; hooked hairs absent - . . . . Loosestrife Family (Lythraceae*).

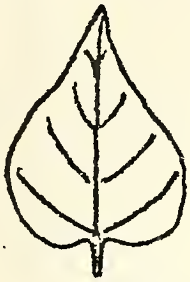


Fig. 51

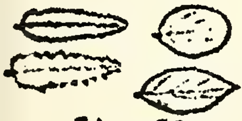


Fig. 52

92b. Stems round ○ or angular ⬡ but never square □ - 98.

98a. Plants with fleshy leaves (greater than 1/8 inch thick - 99.

99a. Leaves and stems both fleshy - 100.

100a. Leaves mostly opposite, some tending towards alternate - Purselane Family (Portulacaceae).

100b. Leaves alternate or whorled - . . Stone Crop Family (Crassulaceae).

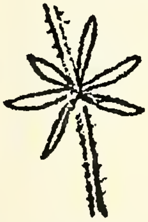


Fig. 53

99b. Leaves fleshy but stems not fleshy - . . . . . . Purselane Speedwell; Figwort Family (Veronica peregrina; Scrophulariaceae) (Fig. 54).

98b. Plants without fleshy leaves (less than 1/8 inch thick - 101.

101a. Leaves alternate - 102.

102a. Membraneous stipules sheathing the stem above each node (Fig. 20) OR petiole inflated and sheathing the stem above each node (Fig. 27) - 103.

103a. Sheathing stipule membranous (Fig. 20); leaves simple - . . . . Smartweed Family (Polygonaceae).

103b. Petiole inflated and sheathing stem (Fig. 27); leaves divided (Fig. 26) - . . . . Carrot Family (Umbelliferae).

102b. Sheathing stipules absent; petiole not inflated and sheathing stem - 104.

104a. Stems distinctly striated (striations green and white, red and green or red and white), and/or angular ⬡ , never round ○ - 105.

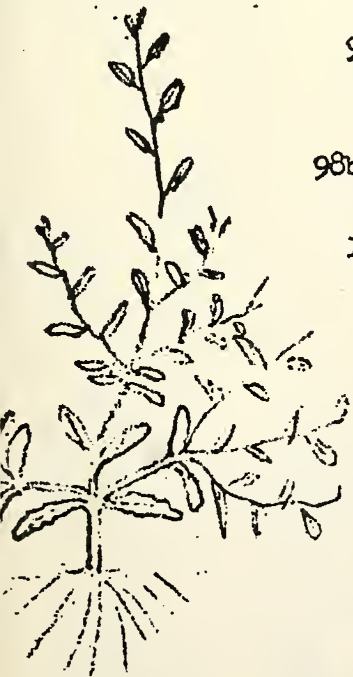


Fig. 54

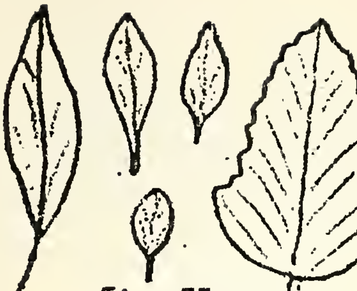


Fig. 55

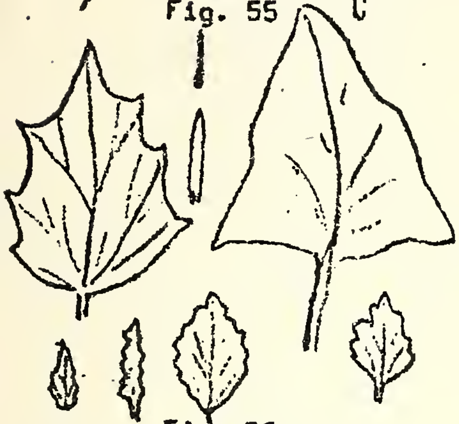
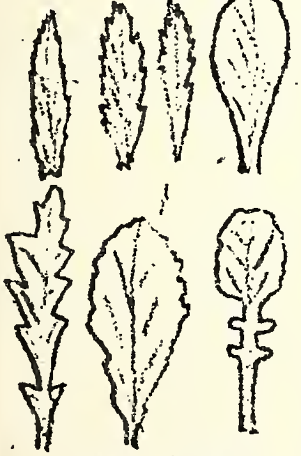
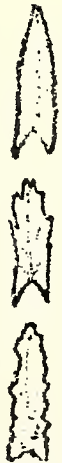


Fig. 56



lower leaves
Fig. 57



upper leaves
Fig. 58

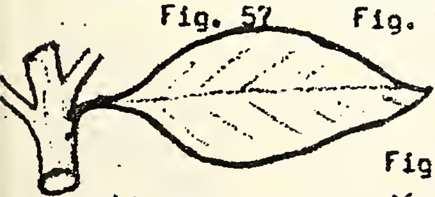


Fig. 59

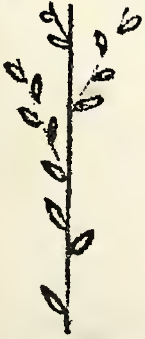


Fig. 60

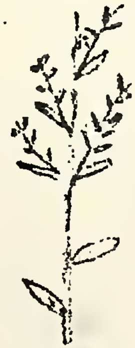


Fig. 61

105a. Leaves rounded or egg-shaped in profile (Fig. 55); never deeply lobed - . . . . Pigweed Family (Amaranthaceae)*.

105b. Leaves deltoid or elongate, often lobed or deeply cut (Figs. 56 and 57) - 106.

106a. Leaves deltoid or elongate often lobed (Fig. 56); young leaves with a mealy appearance or rank odor - . . . . Goosefoot Family (Chenopodiaceae)*.

106b. Leaves deeply cut or variously toothed (Fig. 57), particularly the basal leaves; often with a peppery taste - . . . . Mustard Family (Cruciferae)*.

104b. Stems not distinctly striated, round - 107.

107a. Coarse plants with whitish stems covered with viscid, bristly, bared or hooked hairs - . . . Loasa Family (Loasaceae).

107b. Without the above combination of characters - 108.

108a. Large perennial (up to 6 feet) from a fleshy taproot; stem large and pithy, often reddish; leaves egg-shaped, without hairs and up to 10 inches in length (Fig. 59) - Pokeweed; Pokeweed Family (Phytolacca americana; Phytolaccaceae).

108b. Without the above combination of characters - 109.

109a. Leaves without petioles; plants slender and wiry (Fig.60,61)- 110.

110a. Plants much branched from base, each branch subtended by a leaf larger then the leaves on the branch itself (Fig. 60) - ...... Rockrose Family (Cistaceae).

110b. Plants branched only near the top with many large stem leaves interspersed between the branches (Fig. 61) - Flax Family (Linaceae).

109b. Without the above combination of characters - 111.

111a. Leaves (especially lower leaves) round to egg-shaped, entire and on long petioles (Fig. 62) - 112.

112a. Leaves covered with white or orange pubesence (Fig. 62a) - ..... Croton Plant Group; Spurge Family (Croton, Crotonopsis; Euphorbiaceae).

112b. Leaves sparsely hairy; lower leaves opposite (Fig. 62b) - .... Three-seeded Mercury; Spurge Family (Acalypha; Euphorbiaceae).

111b. Leaves not as above - 113.

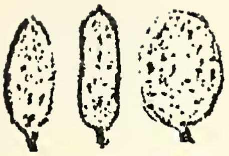
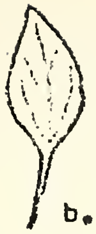


Fig. 62 a.



b.

113a. Leaves petioled, often with toothed or wavy margins (Fig. 57); stems smooth or with stiff hairs. If densely hairy, then also viscid (sticky, clammy) to the touch - 114.

114a. Leaves with stiff hairs on the veins of their under surfaces (Fig. 63) - .... Mustard Family (Cruciferae).

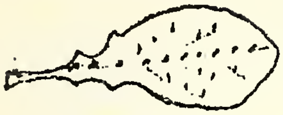


Fig. 63

114b. Leaves with hairs absent or on both surfaces of leaf - 115.

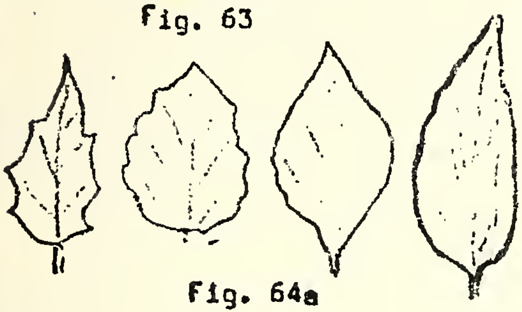


Fig. 64a

115a. Leaves with hairs absent; often with rank-smelling foliage (Fig. 64a) - Potato Family (Solanaceae).

115b. Leaves with hairs - 116.

116a. Leaves deeply cut; hairs stiff, foliage not rank smelling (Fig.65) - Waterleaf Family (Hydrophyllaceae).

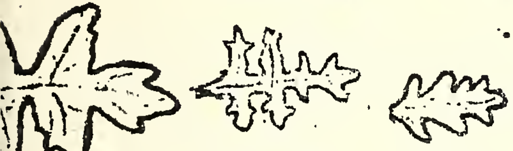


Fig. 65

116b. Leaves entire or toothed; hairs soft and viscid; foliage often rank smelling (Fig. 64b) - .... Potato Family (Solanaceae).

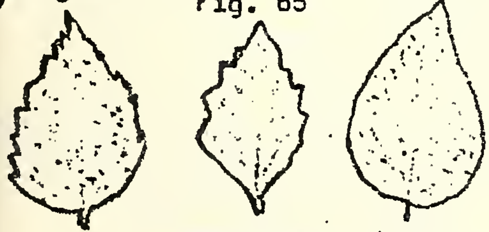


Fig. 64b

113b. Leaves without petioles and entire (Fig. 23); hairs usually covering both upper and lower surfaces of leaf; stems gray-green and tending toward densely hairy but not viscid, the hairs pliable - Borage Family (Boraginaceae)*.

101b. Leaves opposite or whorled - 117.

117a. Leaves with stinging hairs - 118.

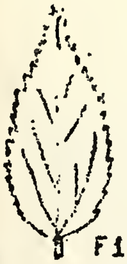


Fig. 66

118a. Leaves broadly egg-shaped or linear with regularly toothed margins (Fig. 66) - .... Nettle Family (Urticaceae).

118b. Leaves rounded, deeply cut and irregularly toothed (Fig. 67) - Tragia; Spurge Family (Euphorbiaceae).

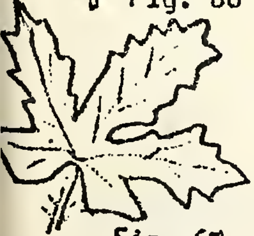


Fig. 67

117b. Leaves without stinging hairs - 119.

119a. Leaves fastened in pairs directly to joints of stem together with long bristles (Fig. 68) - .... Rough Button Weed; Madder Family (Diodia teres; Rubiaceae).

119b. Leaves not fastened in pairs directly to joints of stem together with long bristles - 120.

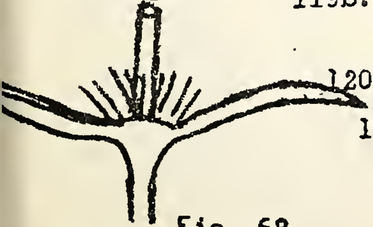


Fig. 68

120a. Nodes swollen (Fig. 69) - 121.

121a. Leaves heart-shaped (Fig. 51); stem dichotomously branched (Fig. 70) - .... Wild Four O'Clock Family (Nyctaginaceae).

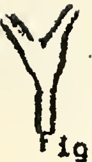


Fig. 69

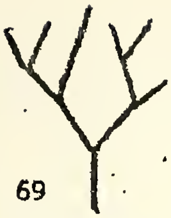


Fig. 70

121b. Leaves elongate, linear or egg-shaped, often clasping the stem or united by a ring around the stem (Fig. 71) - Pink Family (Caryophyllaceae).

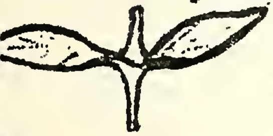


Fig. 71

120b. Nodes not swollen - 122.

122a. Leaves entire and punctate (appearing as full of pinholes or covered with small black dots) (Fig. 72); stems tending to be woody near base - ....St. John's Wort Family (Guttiferae).

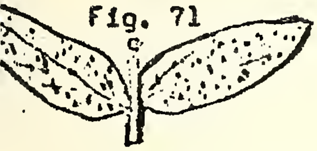


Fig. 72

122b. Leaves not punctate - 123.

123a. Leaves with petioles - 124.

124a. Leaves with bitter taste resembling peach or wild cherry leaves - ....Figwort Family (Scrophulariaceae).

124b. Leaves without bitter taste - 125.

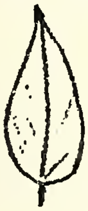


Fig. 73

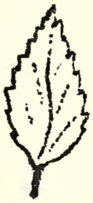


Fig. 74

125a. Leaves with entire margins (Fig. 73) - ....Primrose Family (Primulaceae).

125b. Leaves with toothed margins (Fig. 74) ....Lopseed Family (Phrymaceae).

123b. Leaves without petioles - 126.

126a. Opposite leaves without stipules or leaves whorled - 127.

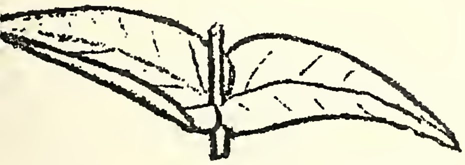


Fig. 75

127a. Leaf bases next to or clasping the stem, whorled or united by a ring around the stem or deltoid in appearance. (Fig. 75) - 128.

128a. Leaves 3-8 inches long - ....Honeysuckle Family (Caprifoliaceae).

128b. Leaves less than 1-3 inches long - 129.

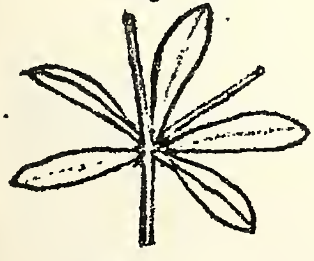


Fig. 76

129a. Leaves opposite - 130.

130a. Leaves with a bitter taste resembling peach or wild cherry leaves - .... Figwort Family (Scrophulariaceae)*.

130b. Leaves without a bitter taste - ....Phlox Family (Polemoniaceae)*.

129b. Leaves whorled; plants creeping (Fig. 76) - Carpetweed; Carpetweed Family (Mollugo verticillata; Aizoaceae).

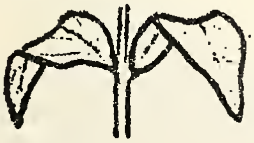


Fig. 77

127b. Leaf bases away from stem, tapering at both ends (Fig. 77), never whorled - ....Acanthus Family (Acanthaceae)*.

126b. Opposite leaves with stipules - ....Madder Family (Rubiaceae).

78B. LEAVES COMPOUND - 131.

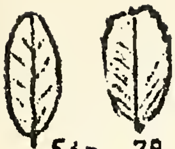


Fig. 78

131a. Leaves with stipules - 132.

132a. Leaflet margins entire or only slightly toothed (Fig. 78) - ......Legume Family (Leguminosae).

132b. Leaflet margins toothed or lobed (Fig. 79) - 133.

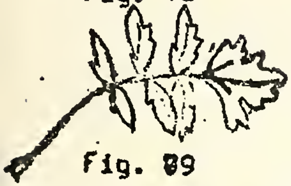


Fig. 79

133a. Leaf petioles straight - Rose Family (Rosaceae).

133b. Leaf petioles gently curving (Fig. 79) - ....Waterleaf Family (Hydroplyllaceae).

131b. Leaves without stipules - 134.

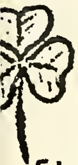


Fig. 80

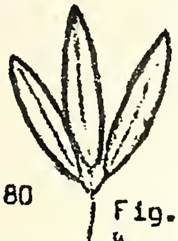


Fig. 81

134a. Leaves trifoliate (Fig. 80). - 135.

135a. Plants herbaceous; leaflets entire or heart-shaped (Fig. 80,81) - 136.

136a. Leaflets heart-shaped (Fig. 80) and with a sour taste - Yellow Wood Sorrel Family (Oxalidaceae).

136b. Leaflets entire (Fig. 81), no sour taste - ....Caper Family (Caparidaceae).

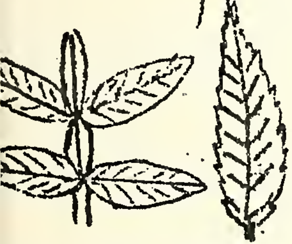


Fig. 82

135b. Plants woody at base; leaflets toothed (Fig. 82) - ....Sumac Family (Anacardiaceae).

134b. Leaflets more than 3 - 137.

137a. Leaves palmately compound with 5-7 narrow lanceolate leaflets; leaflets with star-shaped hairs (Fig. 83) - Hemp; Hemp Family (Cannabis sativa; Cannabinaceae).

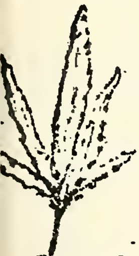


Fig. 83

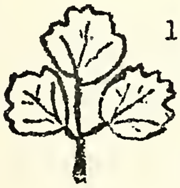


Fig. 84

137b. Leaves pinnately compound (Fig. 46) - 138.

138a. Petiole inflated and sheathing the stem (Fig. 27) - .... Carrot Family (Umbeliferae)*.

138b. Petiole not both inflated and sheathing the stem - 139.

139a. Leaflets with palmate venation (Fig. 84) - .... Buttercup Family (Ranunculaceae).

139b. Leaflets with pinnate venation - 140.

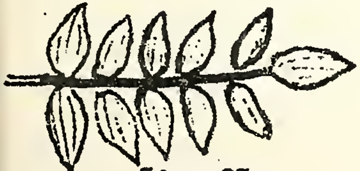


Fig. 85

140a. Leaflets entire (Fig. 85) - .... Phlox Family (Polemoniaceae).

140b. Leaflets toothed or variously lobed and finely divided (Fig. 31) --................................... Waterleaf Family (Hydrophyllaceae).

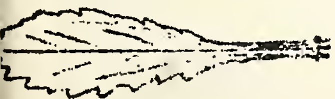


Fig. 86

* Members of the plant families marked by an asterisk are often confused with members of the Sunflower Family (Compositae) when identification is based solely on vegetative characteristics. To distinguish Composites from other plant families, make the following test:

Remove several leaves pulling downward and examine the ases of the petioles. Petioles of Composites will be flattened with leaf blade tissue running nearly to the base. They will be firmly attached to the stem by several groups of veins which will often protrude from the detached petiole base of a mature leaf like celery fibers in 2-3 groups (Fig. 86). The two veins at the extreme edges of the petiole base are characteristic of Composites.

V. REGIONAL FLORAS AND PLANT IDENTIFICATION MANUALS

NALD, M. L. Gray's Manual of Botany. ed. 8, American Book Company, Boston, 1632 pp., 1950.

A botanical manual listing about 5500 species of the Northeastern and North Central states and Canada. Some illustrations are provided but definitely not a book for beginners. Fernald provides an excellent glossary and frequent excursions to this part of the book will be necessary.

ASON, H. A. The New Britton and Brown Illustrated Flora of the Northeastern United States and Adjacent Canada, 3 vols., New York Botanical Garden, New York, 1952.

A descriptive flora with keys to species of the northeastern and North Central states with illustrations for most species. A modern and easy aid to plant identification.

ASON, H. A. and ARTHUR CRONQUIST. Manual of Vascular Plants of Northeastern United States and Adjacent Canada. D. van Nostrand Co., Inc. Princeton, N. J., 1963.

An authoritative, illustrated, one volume treatis of the flora of eastern North America.

CHCOCK, A. S. and AGNES CHASE. Manual of the Grasses of the United States, 2 ed., rev., U. S. D. A. Misc. Publ. 200, 1051 pp., 1950.

An inexpensive, easy to use and illustrated manual for identification of grasses. The manual includes descriptions of all 1,398 species of grasses known to grow in the continental United States and Alaska. Descriptions include a distribution map for most species.

LY, D. Weed Identification and Control, 2nd. ed., Iowa State University Press, Ames, Iowa, 400 pp., 1960.

A text on weed identification and control with emphasis on family characteristics, with illustrations and descriptions of individual weeds as well as control methods.

GSBURY, J. M. Poisonous Plants of the United States and Canada. Prentice Hall, Inc., Englewood Cliffs, N. J. 1964.

The most comprehensive and authoritive treatment of plants poisonous to man and livestock. The book is illustrated and an excellent reference work but not suitable as a general plant identification manual.

TGOMERY, F. H. Weeds of the Northern United States and Canada. Frederick Warne & Co., Inc., New York. 226 pp. 1964.

This handy little book provides descriptions for 365 weeds frequently found in Canada and in the United States north of the 36th parallel. Most weeds are illustrated with line drawings which unfortunately lost some detail in the printing. Plants are grouped according to family with keys provided for the larger families.

ENCHER, W. C. Weeds. Macmillan, New York, rev. ed., 1955.

The standard text for weed identification for the United States and much of Canada. Over 500 species are treated with the majority illustrated.

RTH CENTRAL STATES REGIONAL COMMITTEE. Weeds of the North Central States. Ill. Agr. Exp. Sta. Circ. 718 (North Central Reg. Publ. 16), rev., 262 pp., 1960

An inexpensive and extremely useful weed identification bulletin containing descriptions and illustrations of over 200 weedy plants. The first edition of PLANT IDENTIFICATION USING FAMILY CHARACTERISTICS was perpared specifically to supplement this bulletin. Available from mailing offices of experiment stations in the North Central states.

EYERMARK, J. A. Spring Flora of Missouri. Lucas Bros., Columbia, Missouri, 582 pp., 1964.

An excellent illustrated spring flora available in paper back at nominal cost. Although dealing with Missouri flora, most of the species extend throughout the North Central region.

VI. GLOSSARY

NUALS - Plants which only live for a year. (Complete their life cycle in one year)

IL - The angle formed between an axis (such as the stem) and any organ (such as the leaf) that arises from it.

SAL ROSETTE - A cluster of basal leaves arranged in a circular form.

AKED - Ending in a firm, prolonged, slender tip

ENNIALS - Plants living for two years only and blooming the second year.

NOMIAL - The generic and specific name of an organism.

ADDERY - Inflated, empty, with thin walls like the bladder of an animal.

ACT - A modified, often scale-like leaf attached to the stem beneath a flower, or inflorescence.

LB - An underground leaf-bud with fleshy scales or coats.

LBLET - A small bulb often arising in the inflorescence of some other unusual place.

R - Any rough or prickly envelope.

IMBING - Ascending by using other objects as a means of support.

MPOUND - An aggregation of similar parts.

RM - The enlarged fleshy base of a stem, bulb-like but solid; or a solid bulb.

TYLEDON - Seed leaf, the primary leaf or leaves of the embryo.

LM - A jointed stem of the grasses (*Gramineae*) or Sedges (*Cyperaceae*).

CHOTOMOUSLY - Branching by forking in pairs, the paired branches of about equal size.

GITATE - Finger-like

VIDED - Characterized by lobing or segmentation that extends to near the base.

TIRE - With a continuous unbroken margin.

VELOPE - That part which surrounds.

ORA - The aggregate of plants growing in an area or the work which lists them.

OND - The leaf of a fern or a palm.

ABROUS - Smooth; without hairs.

AND - A secreting structure on the surface, embedded or ending in a hair or any similar protuberance.

ERB or HERBACEOUS - A non-woody plant; a plant naturally dying to the ground at the end of the growing season.

OST - A plant which nourishes a parasite.

NFLORESCENCE - The arrangement of the flowers on a plant; often the flower cluster.

NTERNODE - The portion of a stem between two successive nodes.

NTRODUCED - Not native; brought from another region.

RREGULAR - Not regular in form; assymetric as a flower which cannot be halved in any plane or in one plant only; zygomorphic.

OINT - A node

EAFLET - A single division of a compound leaf.

EAF SHEATH - The lower part of the petiole surrounding the stem.

EMBRANOUS - Thin, often more or less translucent.

UCILAGINOUS - Slimy or viscid.

ODE - A joint bearing a leaf.

OXIOUS - Different to control or especially hard to control.

REA - The membranous stipules of the Smartweed Family (Polygonaceae).

PPOSITE - On both sides at the same level.

LMATE - Resembling a hand with the fingers spread; having parts radiating from a common point.

RALLEL-VEINED - With lateral veins straight or the entire system parallel.

RENNIALS - Plants living for more than 2 years.

TIOLE - The stem of a leaf.

NNATE - A compound leaf with leaflets placed side by side along the rachis.

TH - The spongy center of a stem.

ICKLE - A small and weak, spine-like body.

OSTRATE - Living flat on the ground.

BESCENT - Hairy

NCTATE - Dotted, usually denoting the presence of glands either on the surface or within the tissues.

ACHIS - An axis bearing flowers or leaflets.

HIZOME - A subterranean stem usually rooting at the nodes.

AGITTATE - Shaped like the barbed head of an arrow.

AP - The juice of a plant.

CALE - Usually a reduced leaf.

CAPE - A leafless stem arising from the ground and bearing an inflorescence.

CURFY - Covered with small bran-like scales.

ERRATE - With sharp teeth on the margin pointing forward.

ESSILE - Without a stalk.

HEATH - Any more or less tubular structure surrounding a stem or part.

IMPLE - Of one piece, not compound.

PINE - A short outgrowth, a modified branch, stipule, petiole or other part.

EM - The main leaf and inflorescence bearing axis of a plant.

IPULES - Leaf-like or sometimes membraneous appendages at the base of the leaf.

OLON - A basal branch disposed to rooting.

CCULENT - Fleshy and juicy.

MMETRICAL - Capable of division by a longitudinal plane into similar halves.

STEMATIC BOTANY - The study of plant relationships and taxonomic arrangement.

NDRIL - A portion of a stem or leaf modified to serve as a holdfast organ.

RRESTRIAL - Growing in soil as contrasted with growing in aquatic environments.

BER - A thickened and short subterranean branch having numerous buds or eyes.

NATION - Arrangement of the veins.

ED - A plant for which no use has yet been found, or any plant growing where it is not in man's best interest.

ORL - An arrangement of leaves, etc. in a circle around the stem.

NTER ANNUAL - An annual plant which starts growth in the fall, lives through the winter, blossoms in the spring and dies in spring or early summer.

f: Featherly, H. I. Taxonomic Terminology of Higher Plants, Iowa State College Press, Ames, Iowa, 166 pp. 1954.